

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Phyllostegia floribunda*

COMMON NAME: No common name

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: August 2005

STATUS/ACTION

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☒ 12-month warranted but precluded - FR date: May 11, 2005

☐ Did the petition request a reclassification of a listed species?

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): 1999

☐ Candidate removal: Former LP: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

☐ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

☐ F – Range is no longer a U.S. territory.

☐ I – Insufficient information exists on biological vulnerability and threats to support listing.

☐ M – Taxon mistakenly included in past notice of review.

☐ N – Taxon does not meet the Act's definition of "species."

☐ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Lamiaceae (Mint family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii,

island of Hawaii

LAND OWNERSHIP:

Private, State, and Federal. A population of *Phyllostegia floribunda* occurs within the boundaries of Hawaii Volcanoes National Park at Napau Crater and in the State's Laupahoehoe Natural Area Reserve, and the remaining two populations are found on private land.

LEAD REGION CONTACT: Paul Phifer, 503-872-2823, paul_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, 808-792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION:

Species Description *Phyllostegia floribunda* is an erect subshrub with stems 3 to 9 decimeters (12 to 35 inches (in)) long and covered with hirsute hairs. Leaves are pale on the lower surface, membranous, somewhat flaccid and ovate in shape with crenate margins. In addition, they are moderately covered with hirsute hairs and sparsely dotted with glands. Flowers are arranged two per verticillaster on short leafless lateral branches arising in the axils or below the lowermost leaves, forming racemose inflorescences. They are hirsute throughout, with each flower subtended by an obovate, ciliate bract. The corolla is maroon to red with a white base and a straight tube. Nutlets are 3 to 3.5 millimeters (0.12 to 0.14 in) long (Wagner *et al.* 1999a).

Taxonomy *Phyllostegia floribunda* was described by Bentham. This species is recognized as a distinct taxon in Wagner *et al.* (1999a) and Wagner and Herbst (2003), the most recently accepted Hawaiian plant taxonomy.

Habitat Typical habitat is mesic to wet forest at elevations between 430 to 1,130 meters (1,400 to 3,700 feet) (Wagner *et al.* 1999a; Linda Pratt, U.S. Geological Survey-Biological Resources Discipline, pers. comm. 1999).

Historical and Current Range/Current Status This species is known from 13 locations totaling fewer than 100 individuals on State, private, and Federal lands (Hawaii Volcanoes National Park). Only one individual is reported at each of approximately half of the locations. This species is found on the island of Hawaii in Laupahoehoe Natural Area Reserve, Hawaii Volcanoes National Park, and two populations on private lands in Pauuilo (L. Pratt, pers. comm. 1999). A previously reported population from Hawaii Volcanoes National Park's Olaa Tract can no longer be located; however, the Park Service has outplanted individuals to restore this population in the Olaa Tract (L. Pratt, pers. comm. 2005). The Napau Crater population has not been visited recently, but few individuals are likely to persist there (L. Pratt, pers. comm. 2005). While we have not been provided with current survey information and do not know the long-term trends of this species due to lack of historical data, it is reasonable to assume the populations have continued to decline because not all of the threats are being managed throughout its range.

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

This species is threatened by feral pigs (*Sus scrofa*) that degrade and destroy habitat (L. Pratt, pers. comm. 1999). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitat. Pigs are currently present on the island of Hawaii and inhabit rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a major vector in the spread of many introduced plant species (Cuddihy and Stone 1990; Wagner *et al.* 1999a). Pig exclusion fences protect some individuals of this species; however, without continued monitoring and maintenance of those fences, pigs from surrounding areas can easily access fenced areas. In addition, the remaining, unfenced individuals of this taxon are still impacted by this threat.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

None known.

C. Disease or predation.

Because Hawaii's native plants evolved without any browsing or grazing mammals present, many lost natural defenses to such impacts (Carlquist 1980, Lamoureux 1994). Browsing by ungulates has been observed on many other native species, including common and rare or endangered species (Cuddihy and Stone 1990; Loope *et al.* 1991). Therefore, even though there are no observations of browsing for this species, it is likely that pigs impact this species directly as well as their indirect impacts to the surrounding habitat. Pig exclusion fences protect some individuals of this species; however, without continued monitoring and maintenance of those fences, pigs from surrounding areas can easily access fenced areas. In addition, the remaining, unfenced individuals of this taxon are still impacted by this threat.

D. The inadequacy of existing regulatory mechanisms.

On State and private lands, pigs are managed as game animals, but many populate inaccessible areas where hunting is difficult, if not impossible, and therefore has little effect on their numbers. Pig hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii Department of Lands and Natural Resources n.d.-a, n.d. b, n.d.-c). However, public hunting does not adequately control the number of ungulates to eliminate this threat to native plant species.

E. Other natural or manmade factors affecting its continued existence.

Alien plant species threaten this species (L. Pratt, pers. comm. 1999). Although the exact pest species that threaten this plant have not been identified, alien pest plants are found throughout the areas where this species occurs. The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent were introduced from other parts of the world, and nearly 100

species have become pests (Smith 1985; Wagner *et al.* 1999a). Confirmed personal observations (L. Pratt, pers. comm. 1999) and several studies (Cuddihy and Stone 1990; Wood and Perlman 1997; Robichaux *et al.* 1998) indicate nonnative plant species may outcompete native plants similar to *Phyllostegia floribunda*. Competition may be for space, light, water, or nutrients, or there may be a chemical inhibition of other plants (Smith 1985; Cuddihy and Stone 1990). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smathers and Gardner 1978; Smith 1985; Loope and Medeiros 1992; Medeiros *et al.* 1992; Ellshoff *et al.* 1995; Meyer and Florence 1996; Medeiros *et al.* 1997; Loope *et al.* 2004). In particular, alien pest plant species modify habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985; Cuddihy and Stone 1990; Vitousek *et al.* 1987). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to the mesic to wet forest habitat of *P. floribunda*, the Service believes nonnative plant species are a threat to *Phyllostegia floribunda*. Nonnative plants are being controlled around some individuals of this species, but will probably never be completely eradicated because new propagules are constantly being dispersed into the fenced area from surrounding, unmanaged lands. Currently, many widespread alien plant taxa cannot be completely eradicated from the island of Hawaii, and therefore are expected to continue dispersing into previously managed areas (Loope 1998, Smith 1985). The remaining unmanaged populations of *Phyllostegia floribunda* are still impacted by this threat.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

Funding has been provided by the Service, through a cooperative agreement with private landowners on the island of Hawaii, for restoration of forest habitat and eradication of nonnative plant species at Pauuilo. The fencing has been completed and ungulates have been removed, and control of nonnative plant species continues, as does outplanting of common and endangered plant species. The Service has also provided funding in 2005 to a private landowner for fencing and reintroduction within historical range of the species at Kona Hema (Shallenberger 2005). These actions are expected to provide protection to the individuals of *Phyllostegia floribunda* in this area. A wild population of *Phyllostegia floribunda* occurs within the boundaries of Hawaii Volcanoes National Park. These plants are protected by National Park Service regulations that provide for the conservation of native plants and natural resources located within park boundaries. The Park Service has fenced the wild population and is conducting alien plant control. In addition, the Park Service has outplanted individuals to restore the lost population in Olaa Tract (L. Pratt, pers. comm. 2005). This species is represented in *ex situ* collections at Lyon Arboretum's Seed Storage Facility and the Volcano Rare Plant Facility (U.S. Fish and Wildlife Service Controlled Propagation Database 2005).

SUMMARY OF THREATS

The major threats to this taxon are feral pigs that directly prey upon it, degrade and destroy habitat, and nonnative plants that compete for light and nutrients. Feral pigs have been fenced out of the forest at Pauuilo and on Park Service land where *Phyllostegia bracteata* currently occurs or has occurred in the past and has been reintroduced, but the fences must be continually maintained to prevent incursion. Nonnative plants have been reduced in Pauuilo and on Park Service land that is fenced at Napau Crater and Olaa Tract. These on-going conservation efforts

for this species benefit only the Pauuilo and the Park Service populations. The unmanaged populations are still impacted by these threats. Long-term monitoring and management will be required to maintain threat free areas.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
	Non-imminent	Subspecies/population	3
		Monotypic genus	4
		Species	5
Moderate to Low	Imminent	Subspecies/population	6
		Monotypic genus	7
		Species	8
	Non-imminent	Subspecies/population	9
		Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:

This species is highly threatened by feral pigs that degrade and destroy habitat, and nonnative plants that compete for light and nutrients. Threats to the habitat of *Phyllostegia floribunda* and to individuals of this species occur throughout its range and are expected to continue or increase without control or eradication. Feral pigs have been fenced out of the forest at Pauuilo and on Park Service land where *Phyllostegia bracteata* currently occurs or has occurred in the past and been reintroduced, but the fences must be continually maintained to prevent incursion. The Laupahoehoe Natural Area Reserve population is not fenced. Nonnative plants have been reduced in Pauuilo and on Park Service lands that are fenced. These on-going conservation efforts for this species benefit only the Pauuilo and the Park Service populations. The unmanaged populations are still impacted by these threats. Long-term monitoring and management will be required to maintain threat free areas.

Imminence:

Threats to *Phyllostegia floribunda* from feral pigs and nonnative plants are imminent because they are ongoing in the unmanaged populations.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted?

No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. In addition, the Service has funded conservation actions that will benefit individuals of *Phyllostegia floribunda*, such as restoration of forest habitat and eradication of nonnative plant species, in Pauilo, on the island of Hawaii. The Park Service maintains a fenced area with weed control and outplanting for this species. Within the Natural Area Reserve, the State attempts to manage pigs levels through public hunting. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *P. floribunda* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING:

Much of the information in this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995, and was updated by personal communication with Linda Pratt of the U.S.G.S. Biological Resources Discipline in 1999. We have incorporated additional information on this species from our files and the most recent supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 2003). In 2004, the Pacific Islands office contacted the following species experts: Bob Hobdy, retired from Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Natural Heritage Program; Art Medeiros, U.S.G.S. Biological Resources Discipline; Hank Oppenheimer, resource manager for Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden. No new information on status or range was provided in 2004. In 2005 we contacted the species experts listed below and confirmation of the status of *Phyllostegia floribunda* was provided by Linda Pratt, U.S.G.S. Biological Resources Discipline.

The Hawaii Natural Heritage Program identified this species as critically imperiled (Hawaii Natural Heritage Program Database 2004). Based on the International Union for Conservation of Nature and Natural Resources Red Plant Data Book rarity categories, this species is recognized as Rare (could be considered at risk) by Wagner *et al.* (1999b).

One species expert provided new information confirming the status of the species this year and the results are included in this assessment.

COORDINATION WITH STATES

In October 2004 we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. Vickie Caraway, the State botanist, reviewed the information for this species and provided no additional information or corrections (V. Caraway, pers. comm. 2005).

LITERATURE CITED

List all experts contacted:

Name	Date	Place of Employment
1. Joel Lau	June 28, 2005	Hawaii Natural Heritage Program

2. Art Medeiros	June 28, 2005	U.S.G.S. Biological Resources Discipline
3. Linda Pratt*	June 28, 2005	U.S.G.S. Biological Resources Discipline
4. Rick Warshauer	June 28, 2005	U.S.G.S. Biological Resources Discipline
5. Hank Oppenheimer	June 28, 2005	Maui Land and Pineapple Company
6. Kapua Kawelo	June 28, 2005	U.S. Army
7. Dave Lorence	June 28, 2005	National Tropical Botanical Garden
8. Steve Perlman	March 29, 2005	National Tropical Botanical Garden
9. Ken Wood	August 2, 2005	National Tropical Botanical Garden
10. Marie Brueggmann	July 13, 2005	U.S. Fish and Wildlife Service
11. Vickie Caraway	June 14, 2005	Hawaii Division of Forestry and Wildlife

*Provided new information on this taxon in 2005

List all databases searched:

Name	Date
1. Hawaii Natural Heritage Program	2004
2. U.S. Fish and Wildlife Service Controlled Propagation Database	2005

Other resources utilized:

Carlquist, S. 1980. Hawaii: A natural history, 2nd edition. Pacific Tropical Botanical Garden, Honolulu. 468 pp.

Center for Biological Diversity, Dr. Jane Goodall, Dr. E.O. Wilson, Dr. Paul Ehrlich, Dr. John Terborgh, Dr. Niles Eldridge, Dr. Thomas Eisner, Dr. Robert Hass, Barbara Kingsolver, Charles Bowden, Martin Sheen, the Xerces Society, and the Biodiversity Conservation Alliance. 2004. Hawaiian Plants: petitions to list as federally endangered species. May 4, 2004.

Cuddihy, L.W., and C.P. Stone. 1990. Alteration of native Hawaiian vegetation; effects of humans, their activities and introductions. Coop. Natl. Park Resources Stud. Unit, Hawaii. 138 pp.

Ellshoff, Z.E., D.E. Gardner, C. Wikler, and C.W. Smith. 1995. Annotated bibliography of the genus *Psidium*, with emphasis on *P. cattleianum* (strawberry guava) and *P. guajava* (common guava), forest weeds in Hawai'i. Cooperative National Park Resources Studies Unit, University of Hawaii. Technical Report 95.

Hawaii, Department of Land and Natural Resources. N.d.-a. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Oahu. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-b. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Molokai. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-c. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Maui. Division of Forestry and Wildlife, Honolulu. 2 pp.

Lamoureux, C.H. 1994. Conserving Hawaiian biodiversity – the role of Hawaiian botanical gardens. Pp. 55-57. In: C.-I Peng and C.H. Chou (eds.). Biodiversity and Terrestrial Ecosystems. Institute of Botany, Academia Sinica Monograph Series No. 14.

Loope, L.L. 1998. Hawaii and Pacific Islands. Pp. 747-774. In: M.J. Mac, P.A. Opler, C.E.

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- Loope, L.L. and A.C. Medeiros. 1992. A new and invasive grass on Maui. Newsletter of the Hawaiian Botanical Society 31: 7-8.
- Loope, L., F. Starr and K. Starr. 2004. Management and research for protecting endangered Hawaiian plant species from displacement by invasive plants on Maui, Hawaii. Weed Technology 18: 1472-1474.
- Medeiros, A.C., L.L. Loope, P. Conant and S. McElvaney. 1997. Status, ecology, and management of the invasive plant, *Miconia calvescens* DC (Melastomataceae) in the Hawaiian Islands. Bishop Mus. Occas. Pap. 48: 23-36.
- Medeiros, A.C., L.L. Loope, T. Flynn, S.J. Anderson, L.W. Cuddihy, and K.A. Wilson. 1992. Notes on the status of an invasive Australian tree fern (*Cyathea cooperi*) in Hawaiian rain forests. American Fern Journal 82: 27-33.
- Medeiros, A.C., Jr., L.L. Loope, and R.A. Holt. 1986. Status of native flowering plant species on the south slope of Haleakala, East Maui, Hawaii. Coop. Natl. Park Resources Stud. Unit, Hawaii, Techn. Rept. 59: 1-230.
- Robichaux, R., J. Canfield, F. R. Warshauer, L. Perry, M. Bruegmann, and G. Carr. 1998. Adaptive Radiation. Endangered Species Bulletin. November/December.
- Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest bird communities of the Hawaiian Islands: Their dynamics, ecology, and conservation. Studies in Avian Biology 9: 1-429. Cooper Ornithological Society, Los Angeles.
- Shallenberger, R. 2005. Habitat restoration at Kona Hema Preserve for alala reintroduction. Proposal to U.S. Fish and Wildlife Service for 2005 funding.
- Smathers, G.A. and D.E. Gardner. 1978. Stand analysis of an invading firetree (*Myrica faya* Aiton) population, Hawai'i. Proceeding of the Second Conference on Natural Science, Hawaii Volcanoes National Park, pp. 274-288.
- Smith, C.W. 1985. Impact of alien plants on Hawai'i's native biota: *in* Stone, C.P., and J.M. Scott (eds.), Hawai'i's terrestrial ecosystems: preservation and management. Coop. Natl. Park Resources Stud. Unit, Univ. Hawaii, Honolulu, pp. 180-250.
- Stone, C.P. 1985. Alien animals in Hawai'i's native ecosystems: toward controlling the adverse effects of introduced vertebrates: *in* Stone, C.P., and J.M. Scott (eds.), Hawai'i's terrestrial ecosystems: preservation and management. Coop. Natl. Park Resources Stud. Unit, Univ. Hawaii, Honolulu, pp. 251-297.
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- Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999a. Manual of the Flowering Plants of Hawai'i, Bishop Mus. Spec. Publ. 97: 1-1918. University of Hawaii Press and Bishop Museum Press, Honolulu.

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- Wood, K.R. and S. Perlman. 1997. Maui 14 plant survey final report. Submitted by National Tropical Botanical Garden, October, 1997.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all 12-month petition findings, additions of species to the candidate list, removal of candidate species, and listing priority changes.

Approve: **Acting** David W. Winkler 11/10/05
Regional Director, Fish and Wildlife Service Date

Marshall P. Jones

Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____
Director, Fish and Wildlife Service Date

Date of annual review: September 20, 2005
Conducted by: Marie M. Brueggmann, Pacific Islands FWO
Plant Recovery Coordinator

Comments:
PIFWO Review

Reviewed by: Christa Russell Date: September 27, 2005
Plant Conservation Program Leader

Gina Shultz Date: October 14, 2005
Assistant Field Supervisor,
Endangered Species

Patrick Leonard Date: October 14, 2005
Field Supervisor